

This document gives pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a Major, Municipal permit. The discharge results from the operation of a 2.0 MGD wastewater treatment plant. This permit action consists of updating the proposed effluent limits to reflect the current Virginia WQS (effective January 6, 2011) and updating permit language as appropriate. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9VAC25-260 et seq.

1. Facility Name and Mailing Address: Wilderness WWTP  
P.O. Box 148  
Ruckersville, VA 22968  
Facility Location: 36075 Wilderness Shores Way  
Locust Grove, VA 22508  
Facility Contact Name/Title: Tim Clemons  
Assistant General Manager  
Facility E-mail Address: [tclemons@rapidan.org](mailto:tclemons@rapidan.org)  
SIC Code : 4952 WWTP  
County: Orange  
Telephone Number: (434)985-7811
2. Permit No.: VA0083411  
Other VPDES Permits associated with this facility: VAN020029  
Other Permits associated with this facility: None  
E2/E3/E4 Status: Not Applicable (NA)  
Expiration Date of previous permit: August 17, 2016
3. Owner Name: Rapidan Service Authority  
Owner Contact Name/Title: Dudley Pattie  
General Manager  
Owner E-mail Address: [dpattie@rapidan.org](mailto:dpattie@rapidan.org)  
Telephone Number: (434)985-7811
4. Application Complete Date: January 28, 2016  
Permit Drafted By: Alison Thompson  
Draft Permit Reviewed By: Susan Mackert  
WPM Review By: Bryant Thomas  
Public Comment Period : Start Date: End Date:  
Date Drafted: August 3, 2016  
Date Reviewed: August 11, 2016  
Date Reviewed:
5. Receiving Waters Information: See Attachment 1 for the Flow Frequency Determination  
Receiving Stream Name : Rapidan River  
Drainage Area at Outfall: 640 sq.mi.  
Stream Basin: Rappahannock  
Section: 4  
Special Standards: None  
7Q10 Low Flow: 12 MGD  
1Q10 Low Flow: 7.6 MGD  
30Q10 Low Flow: 21.7 MGD  
Harmonic Mean Flow: 139 MGD  
Stream Code: 3-RAP  
River Mile: 10.47  
Subbasin: None  
Stream Class: III  
Waterbody ID: VAN-E18R; RA42  
7Q10 High Flow: 76 MGD (Dec-May)  
1Q10 High Flow: 55.7 MGD (Dec-May)  
30Q10 High Flow: 102.3 MGD (Dec-May)  
30Q5 Flow: 36.6 MGD

**6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:**

<input checked="" type="checkbox"/> State Water Control Law	<input checked="" type="checkbox"/> EPA Guidelines
<input checked="" type="checkbox"/> Clean Water Act	<input checked="" type="checkbox"/> Water Quality Standards
<input checked="" type="checkbox"/> VPDES Permit Regulation	Other (PES, Occoquan Policy, Dulles)
<input checked="" type="checkbox"/> EPA NPDES Regulation	

**7. Licensed Operator Requirements: Class I****8. Reliability Class: Class I****9. Permit Characterization:**

<input type="checkbox"/> Private	<input type="checkbox"/> Effluent Limited	<input type="checkbox"/> Possible Interstate Effect
<input type="checkbox"/> Federal	<input checked="" type="checkbox"/> Water Quality Limited	<input type="checkbox"/> Compliance Schedule Required
<input type="checkbox"/> State	<input checked="" type="checkbox"/> Whole Effluent Toxicity Program Required	<input type="checkbox"/> Interim Limits in Permit
<input checked="" type="checkbox"/> POTW	<input checked="" type="checkbox"/> Pretreatment Program Required	<input type="checkbox"/> Interim Limits in Other Document
<input checked="" type="checkbox"/> TMDL	<input checked="" type="checkbox"/> e-DMR Participant	

**10. Wastewater Sources and Treatment Description:**

The facility completed an expansion to the 2.0 MGD flow tier in October 2011. The Certificate to Operate was issued on October 3, 2011 and can be found in Attachment 2 along with the facility schematic. The influent to the Wilderness WWTP is screened and dewatered (GRC10 Grit Monster Vortex Grit Removal System) prior to the influent flow measurement. The plant is now using the old oxidation ditches as surge tanks for flow equalization. The upgraded facility utilizes a 5-stage modified Bardenpho process coupled with chemical addition followed by secondary clarifiers and tertiary filtration to achieve state-of-the-art nutrient removal limitations. Chlorination of the filtered wastewater is done with sodium hypochlorite. Dechlorination is accomplished by sodium bisulfate. After the flows are measured by open-channel ultrasonic sonar, the final effluent flows down a cascade aerator to the Rapidan River.

**TABLE 1 – Outfall Description**

<b>Outfall Number</b>	<b>Discharge Sources</b>	<b>Treatment</b>	<b>Design Flow</b>	<b>Outfall Latitude and Longitude</b>
001	Domestic and/or Commercial Wastewater	See Item 10 above.	2.0 MGD	38°22'30" 77°44'45"
The discharge location is identified on the attached USGS topographic map – Richardsville (discharge location), Germanna Bridge, Chancellorsville, and Mine Run Quadrangles (Attachment 3).				

**11. Sludge Treatment and Disposal Methods:**

The Wilderness WWTP aerobically digests the sludge and uses polymer to thicken the waste sludge prior to dewatering with a filter press. The dewatered solids are land applied through a contractor.

**12. Discharges, Intakes, Monitoring Stations, Other Items in Vicinity of Discharge**

TABLE 2 – Other Items	
VA0021385	Orange STP discharge to Rapidan River at river mile 46.3
VA0027839	Woodberry Forest School STP discharge to Rapidan River at river mile 42.39
3-RAP006.53	DEQ's Ambient Water Quality Monitoring Station located on Rapidan River at the Route 610 bridge.

The Rapidan Service Authority Water Treatment Plant's intake is located upstream of the WWTP's discharge point. Withdrawals from the river are governed by Virginia Water Protection (VWP) Permit No. 96-0271. The permit provides for a maximum daily withdraw rate from the Rapidan River of 2.0 MGD with a maximum instantaneous withdrawal rate of 2083 gallons per minute.

**13. Material Storage:**

TABLE 3 - Material Storage		
Materials Description	Volume Stored	Spill/Stormwater Prevention Measures
Acetic Acid	1000 gallons	Spill containment
Magnesium Hydroxide	5600 gallons	Spill containment
Methanol	5000 gallons	Spill containment
Alum	4200 gallons	Spill containment
Sodium Hypochlorite	4200 gallons	Spill containment
Bisulfite	(6) 55 gallon drums	Stored indoors
Polymer	(4) 55 gallon drums	Stored indoors
Diesel Fuel	6000 gallons	Double wall tank

**14. Site Inspection:**

Performed by DEQ-Water Compliance on October 28, 2014 (Attachment 4).

**15. Receiving Stream Water Quality and Water Quality Standards:**a. Ambient Water Quality Data

This facility discharges to a segment of the Rapidan River that has been neither monitored nor assessed. The nearest DEQ ambient monitoring station is 3-RAP006.53, located at Route 610, approximately 3.9 miles downstream from Outfall 001. The following is the water quality summary for this segment of Rapidan River, as taken from the 2014 Integrated Report:

*Class III, Section 4.*

*DEQ monitoring stations located in this segment of Rapidan River:  
Ambient, biological, and fish tissue monitoring station 3-RAP006.53, at Route 610*

This assessment unit was noted with an observed effect for total phosphorus for the 2006 Integrated Assessment. While nutrients will not be assessed until nutrient standards are adopted for free-flowing streams, the observed effect will remain due to the previous assessment. For the 2006 assessment window, four of 30 samples (13.3%) exceeded the total phosphorus screening value of 0.20 mg/L.

*E. coli* monitoring finds a bacterial impairment, resulting in an impaired classification for the recreation use. A bacteria TMDL for the Rapidan River watershed has been completed and approved. The fish consumption use is impaired for mercury in fish tissue. The aquatic life use is considered fully supporting, but noted for observed effect for total phosphorus. There is insufficient information to determine the wildlife use.

b. 303(d) Listed Stream Segments and Total Maximum Daily Loads (TMDLs)

TABLE 4 -Information on Downstream 303(d) Impairments and TMDLs						
Waterbody Name	Impaired Use	Cause	Distance From Outfall	TMDL completed	WLA	Basis for WLA
<i>Impairment Information in the 2014 Integrated Report</i>						
Rapidan River	Fish Consumption	Mercury	0.9 mile	No	---	---
	Recreation	<i>E. coli</i>	2.8 miles	Rapidan River Basin Bacteria 12/05/2007	3.48E+12 cfu/year <i>E. coli</i>	126 cfu/100 ml <i>E. coli</i> --- 2.00 MGD

Significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal, and the draft 2014 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that much of the mainstem Bay does not fully support this use support goal under Virginia's Water Quality Assessment guidelines. Nutrient enrichment is cited as one of the primary causes of impairment. EPA issued the Bay TMDL on December 29, 2010. It was based, in part, on the Watershed Implementation Plans developed by the Bay watershed states and the District of Columbia.

The Chesapeake Bay TMDL addresses all segments of the Bay and its tidal tributaries that are on the impaired waters list. As with all TMDLs, a maximum aggregate watershed pollutant loading necessary to achieve the Chesapeake Bay's water quality standards has been identified. This aggregate watershed loading is divided among the Bay states and their major tributary basins, as well as by major source categories [wastewater, urban storm water, onsite/septic agriculture, air deposition]. Fact Sheet Section 17.e provides additional information on specific nutrient limitations for this facility to implement the provisions of the Chesapeake Bay TMDL.

The planning statement is found in Attachment 5.

c. Receiving Stream Water Quality Criteria

Part IX of 9VAC25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream, the Rapidan River, is located within Section 4 of the Rappahannock River Basin, and classified as a Class III water.

At all times, Class III waters must achieve a dissolved oxygen (D.O.) of 4.0 mg/L or greater, a daily average D.O. of 5.0 mg/L or greater, a temperature that does not exceed 32°C, and maintain a pH of 6.0-9.0 standard units (S.U.).

The Freshwater Water Quality/Wasteload Allocation Analysis (Attachment 6) details other water quality criteria applicable to the receiving stream.

Some Water Quality Criteria are dependent on the temperature and pH and Total Hardness of the stream and final effluent. The stream and final effluent values used as part of Attachment 6 are as follows:

pH and Temperature for Ammonia Criteria:

The fresh water, aquatic life Water Quality Criteria for Ammonia are dependent on the instream temperature and pH. Since the effluent may have an impact on the instream values, the temperature and pH values of the effluent must also be considered when determining the ammonia criteria for the receiving stream. The 90th percentile temperature and pH values are used because they best represent the critical design conditions of the receiving stream.

Staff has re-evaluated the effluent data since the new facility has now been online since October 2011. Daily pH data from January 2015 through May 2016 were evaluated to establish the 90<sup>th</sup> and 10<sup>th</sup> percentile pH values. The 90<sup>th</sup> percentile pH value is 7.9 S.U. and the 10<sup>th</sup> percentile value is 7.4 S.U. Staff used default values for the effluent of 25°C for the annual temperature and 15°C for the wet season value. The data can be found in Attachment 7.

Ambient water quality data for were available for review. DEQ Field staff has evaluated all the stream data that was available for the period of January 1990 through February 2011 for waterbody VAN-E18R. The 90<sup>th</sup> percentile annual pH value is 8.0

S.U. and the 10<sup>th</sup> percentile value is 6.8 S.U. The 90<sup>th</sup> percentile annual temperature is 25.3°C and the 90<sup>th</sup> percentile wet season temperature is 15.7°C.

Total Hardness for Hardness-Dependent Metals Criteria:

The Water Quality Criteria for some metals are dependent on the receiving stream's total hardness (expressed as mg/L calcium carbonate) as well as the total hardness of the final effluent.

The facility has collected total hardness for the effluent on a semiannual basis during the current permit term. The average total hardness is 208.75 mg/L. The data can be found in Attachment 7.

Ambient water quality data for the receiving stream watershed were available for review. DEQ Field staff has evaluated all the stream data that was available for the period of January 1990 through February 2011 for waterbody VAN-E18R. The stream's total hardness is 27.1 mg/L as CaCO<sub>3</sub>.

Bacteria Criteria:

The Virginia Water Quality Standards at 9VAC25-260-170A state that the following criteria shall apply to protect primary recreational uses in surface waters:

*E. coli* bacteria per 100 ml of water shall not exceed a monthly geometric mean of the following:

	Geometric Mean <sup>1</sup>
Freshwater <i>E. coli</i> (N/100 ml)	126

<sup>1</sup>For a minimum of four weekly samples [taken during any calendar month].

d. Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9VAC25-260-360, 370 and 380) designates the river basins, sections, classes, and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, Rapidan River, is located within Section 4 of the Rappahannock River Basin. This section has not been designated with a special standard.

**16. Antidegradation (9VAC25-260-30):**

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream was classified as Tier 2 during the last reissuance based on a review of ambient water quality monitoring data for toxic parameters. A review of the current ambient monitoring data provides no basis to change the determination; therefore, for the purpose of deriving effluent limits for this permit, the receiving stream in the vicinity of the discharge will again be considered Tier 2. Staff has made no attempt to define boundaries or imply any other use of this determination. The decision to call the stream Tier 2 is in keeping with DEQ's general conservative approach to preparing VPDES permits. No significant degradation to the existing water quality will be allowed. In accordance with current DEQ guidance, no significant lowering of water quality is to occur where permit limits are based on the following:

- The dissolved oxygen in the receiving stream is not lowered more than 0.2 mg/L from the existing levels;
- The pH of the receiving stream is maintained within the range 6.0-9.0 S.U.;
- There is compliance with all temperature criteria applicable to the receiving stream;
- No more than 25% of the unused assimilative capacity is allocated for toxic criteria established for the protection of aquatic life; and
- No more than 10% of the unused assimilative capacity is allocated for criteria for the protection of human health.

The antidegradation policy also prohibits the expansion of mixing zones to Tier 2 waters unless the requirements of 9VAC25-260-30.A.2 are met. The draft permit is not proposing an expansion of the existing mixing zone.

**17. Effluent Screening, Wasteload Allocation, and Effluent Limitation Development:**

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points is equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLA) are calculated. The WLA values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. Effluent limitations are then calculated on the most limiting WLA, the required sampling frequency, and statistical characteristics of the effluent data.

**a. Effluent Screening:**

Effluent data obtained from the permit application and the monthly Discharge Monitoring Reports (DMRs) has been reviewed and determined to be suitable for evaluation. The following pollutants will require a wasteload allocation analysis: Ammonia as N, Total Residual Chlorine, Chloroform, Dichlorobromomethane, Zinc, and Copper.

**b. Mixing Zones and Wasteload Allocations (WLAs):**

Wasteload allocations (WLAs) are calculated for those parameters in the effluent with the reasonable potential to cause an exceedance of water quality criteria. The basic calculation for establishing a WLA is the steady state complete mix equation:

$$WLA = \frac{Co [ Qe + ( f ) ( Qs ) ] - [ ( Cs ) ( f ) ( Qs ) ]}{Qe}$$

Where:	WLA	=	Wasteload allocation
	Co	=	In-stream water quality criteria
	Qe	=	Design flow
	f	=	Decimal fraction of critical flow from mixing evaluation
	Qs	=	Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; 30Q10 for ammonia criteria; harmonic mean for carcinogen-human health criteria; and 30Q5 for non-carcinogen human health criteria)
	Cs	=	Mean background concentration of parameter in the receiving stream.

The Water Quality Standards contain two distinct mixing zone requirements. The first requirement is general in nature and requires the "use of mixing zone concepts in evaluating permit limits for acute and chronic standards in 9VAC25-260-140.B". The second requirement is specific and establishes special restrictions for regulatory mixing zones "established by the Board".

The Department of Environmental Quality uses a simplified mixing model to estimate the amount of mixing of a discharge with the receiving stream within specified acute and chronic exposure periods. The simplified model contains the following assumptions and approximations:

- The effluent enters the stream from the bank, either via a pipe, channel or ditch.
- The effluent velocity isn't significantly greater (no more than 1 - 2 ft/sec greater) than the stream velocity.
- The receiving stream is much wider than its depth (width at least ten times the depth).
- Diffusive mixing in the longitudinal direction (lengthwise) is insignificant compared with advective transport (flow).
- Complete vertical mixing occurs instantaneously at the discharge point. This is assumed since the stream depth is much smaller than the stream width.
- Lateral mixing (across the width) is a linear function of distance downstream.
- The effluent is neutrally buoyant (e.g. the effluent discharge temperature and salinity are not significantly different from the stream's ambient temperature and salinity).
- Complete mix is determined as the point downstream where the variation in concentration is 20% or less across the width and depth of the stream.
- The velocity of passing and drifting organisms is assumed equal to the stream velocity.

If it is suitably demonstrated that a reasonable potential for lethality or chronic impacts within the physical mixing area doesn't exist, then the basic complete mix equation, with 100% of the applicable stream flow, is appropriate. If the mixing analysis determines there is a potential for lethality or chronic impacts within the physical mixing area, then the proportion of stream flow that has mixed with the effluent over the allowed exposure time is used in the basic complete mix equation. As such, the wasteload allocation equation is modified to account for the decimal fraction of critical flow (f).

Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent (e.g., total residual chlorine where chlorine is used as a means of disinfection) and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, ammonia as N is likely present since this is a WWTP treating sewage, total residual chlorine may be present since chlorine is used for disinfection, and Attachment A data indicate Copper, Zinc, Chloroform, and Dichlorobromomethane are present in the discharge. Attachment 6 details the WLAs for these parameters.

#### Antidegradation Wasteload Allocations (AWLAs).

Since the receiving stream has been determined to be a Tier II water, staff must also determine antidegradation wasteload allocations (AWLAs). The steady state complete mix equation is used substituting the antidegradation baseline (Cb) for the in-stream water quality criteria (Co):

$$AWLA = \frac{C_b (Q_e + Q_s) - (C_s) (Q_s)}{Q_e}$$

Where:	AWLA	=	Antidegradation-based wasteload allocation
	Cb	=	In-stream antidegradation baseline concentration
	Qe	=	Design flow
	Qs	=	Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; 30Q10 for ammonia criteria; harmonic mean for carcinogen-human health criteria; and 30Q5 for non-carcinogen human health criteria)
	Cs	=	Mean background concentration of parameter in the receiving stream.

Calculated AWLAs for the pollutants noted in b. above are presented in Attachment 6.

#### c. Effluent Limitations Toxic Pollutants, Outfall 001 –

9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with WLAs and AWLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9VAC25-31-230.D requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

##### 1) Ammonia as N/TKN:

Historically, a Monte Carlo Dissolved Oxygen Model was used to establish the limits for Total Kjeldahl Nitrogen (TKN) for the Wilderness WWTP. All the TKN values were substituted for the ammonia as nitrogen limits. This was done to protect the dissolved oxygen standard in the receiving stream and prevent violation of the Antidegradation Policy.

For the reissuance of the 2006 and 2011 permits, staff used the DEQ Regional Dissolved Oxygen Model (Attachment 8) to establish the TKN limits for the 2.0 MGD flow tier since the Monte Carlo Model did not include this expanded flow tier. Table 5 presents the TKN limitations determined from the modeling.

TABLE 5 - TKN Effluent Limitations			
Design Flow	Tier	Monthly Average (mg/L)	Weekly Average (mg/L)
2.0 MGD	June- November	3.0	4.5
	December- May	7.0	10.5

Staff used the assumption that TKN is equal to approximately twice (2 times) the ammonia value. The Total Kjeldahl Nitrogen (TKN) analysis measures both organic nitrogen and ammonia nitrogen. A TKN limit of 3.0 mg/L assumes that the remaining nitrogen is in the form of refractory organic compounds that will not be easily oxidized and that ammonia is removed when the 3.0 mg/L TKN limit is met. Since the TKN limitations are more stringent than the calculated ammonia limits (Attachment 9), final ammonia limits are not required.

2) Total Residual Chlorine:

Chlorine is used for disinfection so there is reasonable potential for it to be in the final effluent. Staff compared the current calculated WLAs for TRC (Attachment 6) with those calculated during the 2011 reissuance. The Acute and Chronic WLAs are the same; therefore, the TRC limitations for the 2.0 MGD flow tier established with the 2011 reissuance shall be carried forward with this reissuance. The limit derivation is found in Attachment 9.

3) Metals/Organics:*Zinc*

A monthly average limit of 65 ug/L and a weekly average limitation of 65 ug/L were established for the 2.0 MGD flow tier with the last reissuance. The WLAs and subsequent limits were established using the Total Hardness of the new 2.0 MGD facility. Current WLA calculations (Acute WLA of 98 ug/L and a Chronic WLA of 120 ug/L) are higher than those established during the 2011 reissuance. While this would allow for the removal of the zinc limitations (Attachment 9), the current limitations shall remain in place since there have been no additional changes to the treatment since the limitations were established and the facility has been able to comply with the established limitations. The 2011 limit evaluation is also found in Attachment 9.

*Copper*

During the 2011 reissuance, staff included copper and total hardness semiannual monitoring for the 2.0 MGD flow tier. Using the current WLAs of 11 ug/L acute and 9.1 ug/L chronic, staff evaluated the need for copper limitations. The data shows that no limits are necessary, so the monitoring for copper shall be removed with this reissuance.

*Total Hardness*

Since the facility still has limitations for Zinc, the Total Hardness monitoring is proposed to be carried forward with this reissuance. The monitoring shall be concurrent with the collection of the sample for zinc.

*Chloroform*

There were detectable concentrations of Chloroform in the final effluent in the monitoring completed as part of the application for reissuance. The values were 31 ug/L on July 14, 2015, 52.9 ug/L on August 28, 2015, and 32.4 ug/L on January 15, 2016. There is a Human Health Water Quality Standard (WQS) of 21,000 ug/L. Since none of these values are close to the WQS, it is staff's professional judgement that there is no limit necessary and no further monitoring warranted during the next permit term.

*Dichlorobromomethane*

There were detectable concentrations of Dichlorobromomethane in the final effluent in the monitoring completed as part of the application for reissuance. The values were 5.56 ug/L on July 14, 2015, 6.58 ug/L on August 28, 2015, and 5.19 ug/L on January 15, 2016. There is a Human Health Water Quality Standard (WQS) of 2,100 ug/L. Since none of these values are close to the WQS, it is staff's professional judgement that no limit is necessary and no further monitoring is warranted during the next permit term.

d. Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants

No changes to dissolved oxygen (D.O.), carbonaceous biochemical oxygen demand-5 day (CBOD<sub>5</sub>), total suspended solids (TSS), Total Kjeldahl Nitrogen (TKN), and pH limitations are proposed.

The DEQ Regional Dissolved Oxygen Model was run for the 2.0 MGD flow tier. The model used is a steady state stream D.O. model based on the belief that the discharge is continuous in nature. Staff used the same stream characteristics that were used in the original Monte Carlo modeling for the lower flow tiers, but increased the discharge flow and the water treatment plant withdrawal rate. Staff initially ran the model with the CBOD<sub>5</sub> at 14 mg/L which was the limit at the 0.715 MGD flow tier. The model showed that the dissolved oxygen dropped more than 0.2 mg/L and antidegradation would be violated if the CBOD<sub>5</sub> was left at 14 mg/L in the summer. Staff changed the CBOD<sub>5</sub> from 14 mg/L to 8 mg/L to assure antidegradation is protected in the summer months. The model runs for the 2.0 MGD are found in Attachment 8.

It is staff's practice to equate the Total Suspended Solids limits with the CBOD<sub>5</sub> limits. TSS limits are established to equal



CBOD<sub>5</sub> limits since the two pollutants are closely related in terms of treatment of domestic sewage.

pH limitations are set at the water quality criteria.

*E. coli* limitations are in accordance with the Water Quality Standards 9VAC25-260-170.

e. Effluent Annual Average Limitations and Monitoring, Outfall 001 – Nutrients

VPDES Regulation 9VAC25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

As discussed in Section 15, significant portions of the Chesapeake Bay and its tributaries are listed as impaired with nutrient enrichment cited as one of the primary causes. Virginia has committed to protecting and restoring the Bay and its tributaries. Only concentration limits are now found in the individual VPDES permit when the facility installs nutrient removal technology. The basis for the concentration limits is 9VAC25-40 - *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* which requires new or expanding discharges with design flows of  $\geq 0.04$  MGD to treat for TN and TP to either BNR (Biological Nutrient Removal) levels (TN = 8 mg/L; TP = 1.0 mg/L) or SOA (State of the Art) levels (TN = 3.0 mg/L and TP = 0.3 mg/L).

This facility has also obtained coverage under 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia*. This regulation specifies and controls the nitrogen and phosphorus loadings from facilities and specifies facilities that must register under the general permit. Nutrient loadings for those facilities registered under the general permit as well as compliance schedules and other permit requirements, shall be authorized, monitored, limited, and otherwise regulated under the general permit and not this individual permit. This facility has coverage under this General Permit; the permit number is VAN020029. Total Nitrogen Annual Loads and Total Phosphorus Annual Loads from this facility are found in 9VAC25-720 – *Water Quality Management Plan Regulation* which sets forth TN and TP maximum wasteload allocations for facilities designated as significant discharges, i.e., those with design flows of  $\geq 0.5$  MGD above the fall line and  $>0.1$  MGD below the fall line.

This facility has wasteload allocations of 15,228 lb/year Total Nitrogen and 1,142 lb/year Total Phosphorus which were derived using a design flow of 1.25 MGD and concentrations of 4.0 mg/L for Total Nitrogen and 0.30 mg/L Total Phosphorus. At 2.0 MGD, they will have to treat to 2.5 mg/L TN and 0.19 mg/L TP. They have provided an offset plan indicating that SOA treatment will allow them to self-offset up to a flow of 1.67 MGD. The permittee has provided flow projections indicating that they will only be up to 0.93 MGD in 2018. In the long term, the offset plan calls for them to find WLA from another discharger within the Rappahannock River Basin.

Monitoring for Nitrates + Nitrites, Total Kjeldahl Nitrogen, Total Nitrogen, and Total Phosphorus are included in this permit. The monitoring is needed to protect the Water Quality Standards of the Chesapeake Bay. Monitoring frequencies are set at the frequencies set forth in 9VAC25-820. Annual average effluent limitations, as well as monthly and year to date calculations, for Total Nitrogen and Total Phosphorus are included in this individual permit. The annual averages are based on the technology installed as part of the WQIF grant funding.

f. Effluent Limitations and Monitoring Summary:

The effluent limitations are presented in the following table. Limits were established for CBOD<sub>5</sub>, Total Suspended Solids, Total Kjeldahl Nitrogen, Total Phosphorus, Total Nitrogen, Total Recoverable Zinc, pH, Dissolved Oxygen, Total Residual Chlorine, and *E. coli*. Monitoring was established for Flow, Nitrate+Nitrite, Whole Effluent Toxicity, and Total Hardness.

The mass loading (kg/d) for monthly and weekly averages were calculated by multiplying the concentration values (mg/L), with the flow values (in MGD) and a conversion factor of 3.785.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual. The facility shall be allowed to monitor CBOD<sub>5</sub>, TSS, and TKN at a frequency of three days per week while the monthly average flows are less than 1.0 MGD. Once the monthly average flows reach 1.0 MGD for three consecutive months, the frequency shall be five days per week as recommended in the VPDES Permit Manual. The facility shall be allowed to monitor TRC three times per day at 4-hour intervals while the monthly average flows are less than 1.0 MGD. Once the monthly average flows reach 1.0 MGD for three consecutive months, the frequency shall be four times per day at 4-hour intervals as recommended in the VPDES Permit Manual.

The VPDES Permit Regulation at 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal

for CBOD<sub>5</sub> and TSS (or 65% for equivalent to secondary). The limits in this permit are water-quality-based effluent limits and result in greater than 85% removal.

**18. Antibacksliding:**

All limits in this permit are at least as stringent as those previously established. Backsliding does not apply to this reissuance.

**19. Effluent Limitations/Monitoring Requirements:**

Design flow is 2.0 MGD.

Effective Dates: During the period beginning with the permit's effective date and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
CBOD <sub>5</sub> (Jun-Nov) <sup>c</sup>	5	8 mg/L 61 kg/day	12 mg/L 91 kg/day	NA	NA	5D/W	24H-C
CBOD <sub>5</sub> (Dec-May) <sup>c</sup>	5	20 mg/L 150 kg/day	30 mg/L 230 kg/day	NA	NA	5D/W	24H-C
TSS (Jun-Nov) <sup>c</sup>	2	8 mg/L 61 kg/day	12 mg/L 91 kg/day	NA	NA	5D/W	24H-C
TSS (Dec-May) <sup>c</sup>	2	20 mg/L 150 kg/day	30 mg/L 230 kg/day	NA	NA	5D/W	24H-C
TKN (Jun-Nov) <sup>c</sup>	5	3.0 mg/L 23 kg/day	4.5 mg/L 34 kg/day	NA	NA	5D/W	24H-C
TKN (Dec-May) <sup>c</sup>	5	7.0 mg/L 53 kg/day	10 mg/L 76 kg/day	NA	NA	5D/W	24H-C
Dissolved Oxygen	3	NA	NA	6.5 mg/L	NA	1/D	Grab
<i>E. coli</i> (Geometric Mean)	3	126 n/100mL	NA	NA	NA	1/W	Grab
Total Residual Chlorine (after contact tank)	2, 3, 4	NA	NA	1.0 mg/L	NA	4/D at 4-hr Intervals	Grab
Total Residual Chlorine (after dechlorination)	3	0.009 mg/L	0.010 mg/L	NA	NA	4/D at 4-hr Intervals	Grab
Nitrate+Nitrite, as N	3, 6	NL mg/L	NA	NA	NA	1/W	24H-C
Total Nitrogen <sup>a</sup>	3, 6	NL mg/L	NA	NA	NA	1/W	Calculated
Total Nitrogen – Year to Date <sup>b</sup>	3, 6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Nitrogen - Calendar Year <sup>b</sup>	3, 6	3.0 mg/L	NA	NA	NA	1/YR	Calculated
Total Phosphorus	3	NL mg/L	NA	NA	NA	1/W	24H-C
Total Phosphorus – Year to Date <sup>b</sup>	3, 6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Phosphorus - Calendar Year <sup>b</sup>	3, 6	0.30 mg/L	NA	NA	NA	1/YR	Calculated
Total Hardness (as CaCO <sub>3</sub> ) <sup>d</sup>	2, 3	NL mg/L	NL mg/L	NA	NA	1/3M	Grab
Total Recoverable Zinc <sup>d</sup>	3	65 ug/L	65 ug/L	NA	NA	1/3M	Grab
Chronic Toxicity – <i>C. dubia</i> (TU <sub>c</sub> )		NA	NA	NA	NL	1/YR	24H-C
Chronic Toxicity – <i>P. promelas</i> (TU <sub>c</sub> )		NA	NA	NA	NL	1/YR	24H-C

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Stream Model- Attachment 8
6. 9VAC25-40 (Nutrient Regulation)

*MGD* = Million gallons per day.*NA* = Not applicable.*NL* = No limit; monitor and report.*S.U.* = Standard units.*TIRE* = Totalizing, indicating and recording equipment.*1/D* = Once every day.*1/M* = Once every month.*5D/W* = Five days a week.*1/W* = Once every week.*1/3M* = Once every three months.*1/YR* = Once every year.*4/D* = Four samples per day at  
four hour intervals.

**24H-C** = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by  $\geq 10\%$  or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

a. Total Nitrogen = Sum of TKN plus Nitrate+Nitrite

b. See Section 20 a for the Nutrient calculations.

c. See Section 21.1. for the Reduced Monitoring Special Condition for CBOD, TSS, TRC, and TKN.

d. Total Hardness and Total Recoverable Zinc shall be collected concurrently.

**20. Other Permit Requirements:**

- a. Part I.B. of the permit contains Additional Chlorine Monitoring Requirements, Quantification Levels and Compliance Reporting Instructions.

These additional chlorine requirements are necessary per the Sewage Collection and Treatment Regulations at 9VAC25-790 and by the Water Quality Standards at 9VAC25-260-170. A minimum chlorine residual must be maintained at the exit of the chlorine contact tank to assure adequate disinfection. No more than 10% of the monthly test results for Total Residual Chlorine (TRC) at the exit of the chlorine contact tank shall be <1.0 mg/L with any TRC <0.6 mg/L considered a system failure. Monitoring at numerous wastewater treatment plants has concluded that a TRC residual of 1.0 mg/L is an adequate indicator of compliance with the *E. coli* criteria. *E. coli* limits are defined in this section as well as monitoring requirements to take effect should an alternate means of disinfection be used.

9VAC25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9VAC25-31-220.D requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

The calculations for the Nitrogen and Phosphorus parameters shall be in accordance with the calculations set forth in 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia*. §62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this is carried forward in 9VAC25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, these reporting calculations are intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

- b. Permit Section Part I.C., details the requirements for Whole Effluent Toxicity (WET) Program.

The VPDES Permit Regulation at 9VAC25-31-210 requires monitoring and 9VAC25-31-220.I, requires limitations in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. A WET Program is imposed for municipal facilities with a design rate >1.0 MGD, with an approved pretreatment program or required to develop a pretreatment program, or those determined by the Board based on effluent variability, compliance history, IWC, and receiving stream characteristics. This is a major, municipal facility with a design flow of 2.0 MGD.

With this reissuance, the facility shall continue to monitor chronic toxicity using two test species, *Ceriodaphnia dubia* and *P. promelas*. The facility completed quarterly monitoring for two years after the issuance of the Certificate To Operate (CTO) for the 2.0 MGD flow tier and was granted a reduction to annual monitoring since all tests passed the screening criteria. The facility shall continue to monitor for toxicity on an annual basis.

As stated above, reasonable potential determinations must take into account effluent quality and receiving stream variability. This would necessitate a sampling regime that rotates throughout a given calendar year; a quarterly schedule in order to obtain a seasonal perspective of the effluent quality. This methodology coincides with the VPDES Permit Regulation requirements that facilities submit representative data that reflects the seasonal variation in the discharge with each permit application (9VAC25-31-100.K.4.g.). Therefore, it is staff's professional judgement that a WET testing protocol be proposed with this permit action that requires a rotating, quarterly testing regime for each annual monitoring requirement. The schedule as set forth within Part I.C. of the permit will ensure that the discharge is monitored for whole effluent toxicity and demonstrates seasonal variations.

See Attachment 10 for the summary of the past test results and the derivation of the endpoints.

- c. Permit Section Part I.D., details the requirements of a Pretreatment Program.

Wilderness is a POTW with a design capacity of 2.0 MGD. Rapidan Service Authority (RSA) also operates the following POTW's: Town of Gordonsville STP (VA0021105), 0.97 MGD and Town of Madison STP (VA0022845), 0.08 MGD. RSA already implements an approved Pretreatment program for the Wilderness WWTP. Pretreatment program conditions for this permit reissuance are included in Part I.D of the VPDES permit. Currently there are no significant industrial users discharging to the Wilderness WWTP or any of the other RSA facilities.

The pretreatment program conditions in the proposed permit reissuance will include: implementation of the approved pretreatment program that complies with the Clean Water Act, State Water Control Law, state regulations.

**21. Other Special Conditions:**

- a. **95% Capacity Reopener.** The VPDES Permit Regulation at 9VAC25-31-200.B.4 requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. This facility is a POTW.
- b. **Indirect Dischargers.** Required by VPDES Permit Regulation, 9VAC25-31-200 B.1 and B.2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.
- c. **O&M Manual Requirement.** Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190.E. The permittee shall maintain a current Operations and Maintenance (O&M) Manual. The permittee shall operate the treatment works in accordance with the O&M Manual and shall make the O&M Manual available to Department personnel for review upon request. Any changes in the practices and procedures followed by the permittee shall be documented in the O&M Manual within 90 days of the effective date of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.
- d. **CTC, CTO Requirement.** The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.
- e. **Licensed Operator Requirement.** The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9VAC25-31-200 C, and by the Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals Regulations (18VAC160-20-10 et seq.) requires licensure of operators. This facility requires a Class I operator.
- f. **Reliability Class.** The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet a reliability Class of I.
- g. **Water Quality Criteria Reopener.** The VPDES Permit Regulation at 9VAC25-31-220 D. requires establishment of effluent limitations to ensure attainment/maintenance of receiving stream water quality criteria. Should effluent monitoring indicate the need for any water quality-based limitations, this permit may be modified or alternatively revoked and reissued to incorporate appropriate limitations.
- h. **Nutrient Offsets.** The Virginia General Assembly, in their 2005 session, enacted a new Article 4.02 (Chesapeake Bay Watershed Nutrient Credit Exchange Program) to the Code of Virginia to address nutrient loads to the Bay. Section 62.1-44.19:15 sets forth the requirements for new and expanded dischargers, which are captured by the requirements of the law, including the requirement that non-point load reductions acquired for the purpose of offsetting nutrient discharges be enforced through the individual VPDES permit.
- i. **E3/E4.** 9VAC25-40-70 B authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.
- j. **Nutrient Reopener.** 9VAC25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9VAC25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.
- k. **TMDL Reopener.** This special condition is to allow the permit to reopened if necessary to bring it in compliance with any applicable TMDL that may be developed and approved for the receiving stream.

1. **Effluent Monitoring Frequency.** Current agency guidance requires that a facility with a design flow between 1.0- 2.0 MGD collect conventional samples five days a week. The monthly average flows for this facility have averaged 0.804 MGD between Jan 2012 to April 2016. The facility shall be allowed to monitor CBOD<sub>5</sub>, TSS, and TKN for three (3) days per week while the monthly average flows remain under 1.0 MGD. When the facility's monthly average flow reaches 50% of the design flow (1.0 MGD) for 3 consecutive months, the facility shall commence five (5) day per week monitoring for CBOD<sub>5</sub>, TSS, and TKN. The facility shall be allowed to monitor TRC three times per day at 4-hour intervals while the monthly average flows are less than 1.0 MGD. Once the monthly average flows reach 1.0 MGD for three consecutive months, the frequency shall be four times per day at 4-hour intervals as recommended in the VPDES Permit Manual.

## 22. Permit Section Part II.

Required by VPDES Regulation 9VAC25-31-190, Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

## 23. Permit Section Part III.

**Sludge Reopener.** The VPDES Permit Regulation at 9VAC25-31-220.C requires all permits issued to treatment works treating domestic sewage (including sludge-only facilities) include a reopener clause allowing incorporation of any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the CWA. The facility includes a sewage treatment works.

**Sludge Use and Disposal.** The VPDES Permit Regulation at 9VAC25-31-100.P; 220.B.2, and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. The facility includes a treatment works treating domestic sewage.

## 24. Changes to the Permit from the Previously Issued Permit:

- a. Special Conditions:
  - 1) The special conditions related to biosolids are now found in Part III of the permit.
- b. Monitoring and Effluent Limitations:
  - 1) The 0.715 flow tier has been removed since the facility received the CTO for the 2.0 MGD flow tier.
  - 2) The monitoring requirements for the biosolids are now found in Part III of the permit.
  - 3) The Whole Effluent Toxicity monitoring has been updated using current agency guidance.
  - 4) Monitoring for Copper was removed since there was no limit necessary based on the data collected.

## 25. Variances/Alternate Limits or Conditions:

There are no variances or alternate limits.

## 26. Public Notice Information:

First Public Notice Date:

Second Public Notice Date:

Public Notice Information is required by 9VAC25-31-280 B. All pertinent information is on file and may be inspected, and copied by contacting the: DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3834, alison.thompson@deq.virginia.gov. See Attachment 11 for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may request an electronic copy of the draft permit and fact sheet or review the draft permit and application

at the DEQ Northern Regional Office by appointment.

**27. Additional Comments:**

Previous Board Action(s): The facility has received some Warning Letters for limitation exceedances for Total Residual Chlorine and CBOD<sub>5</sub>, as well as for overflows from the collection system that is served by the Wilderness WWTP. No Warning Letters or Notices of Violation have been issued in 2016. There have been no Consent Orders issued to the facility during this permit term.

Staff Comments: None.

Public Comment: